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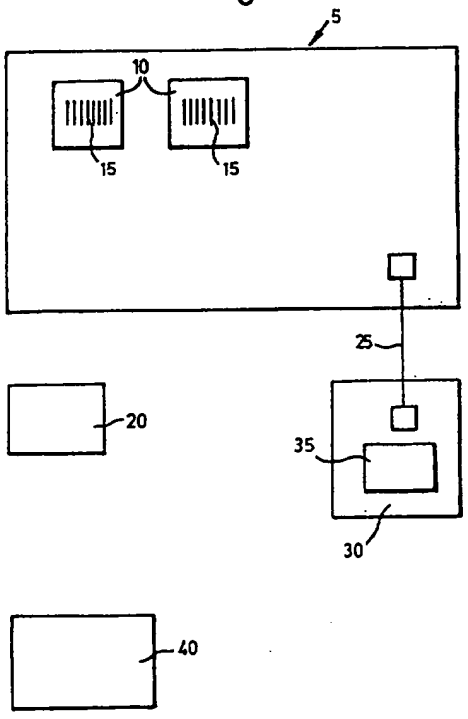
(54) Abstract Title
Plant maintenance

(57) In a maintenance or repair method and system for a plant (5), machine readable indicia (15), e.g. bar codes, are used to uniquely identify component parts (10) of the plant (5) including machinery. This helps to quickly identify faulty component parts (10) and have them repaired, serviced or replaced efficiently. Furthermore, the bar coding can act as a three-dimensional map wherein an indicia reading machine (20), e.g. a portable hand held reader, can be used to read off bar codes and hence assist one in navigating around a plant (5).

Fig.1



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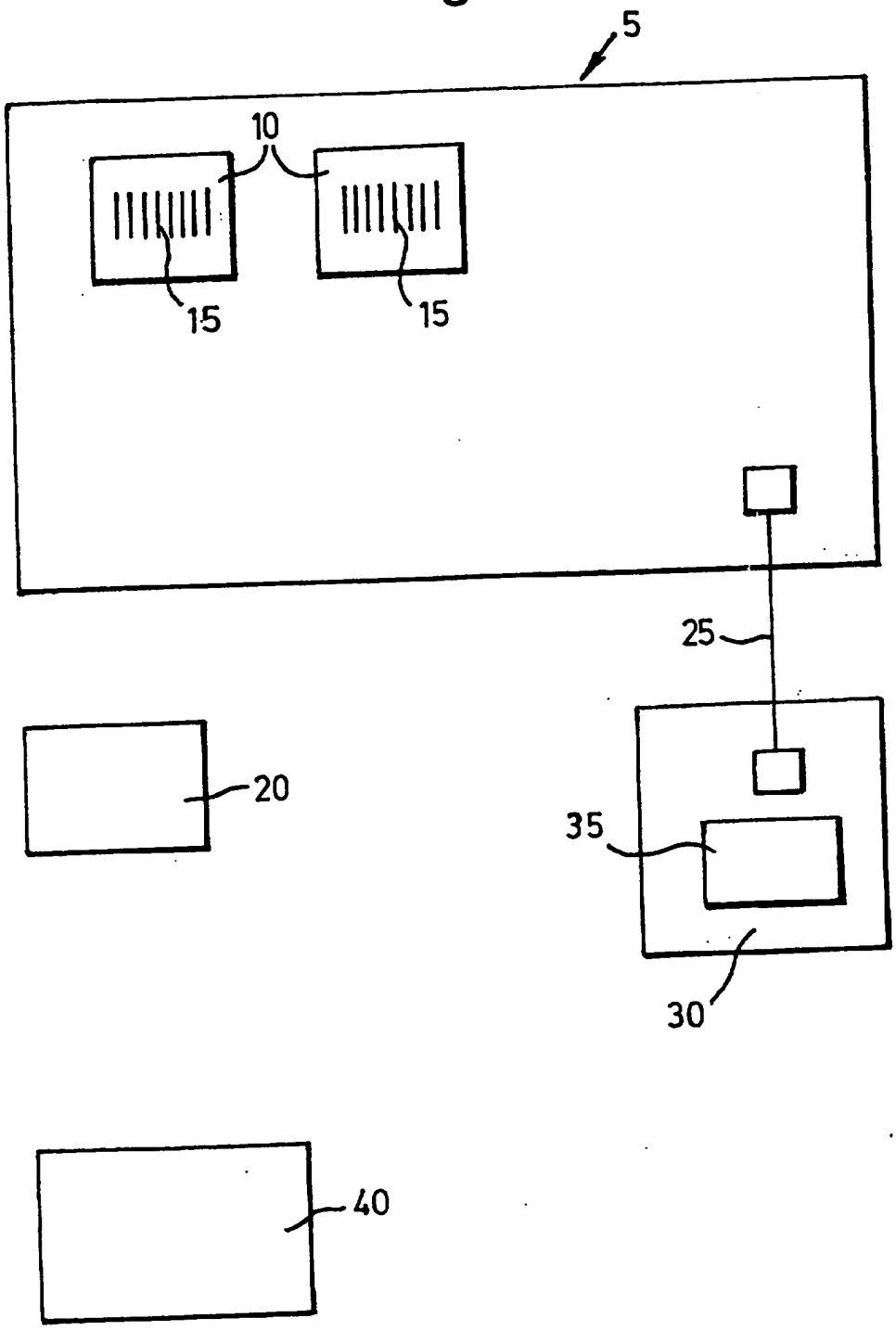
At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

Fig.1



IMPROVEMENTS IN AND RELATING TO PLANT MAINTENANCE METHODS

Background of the Invention

This invention relates to a maintenance or repair method and system. In particular, though not exclusively, this invention relates to maintenance of machinery or plant such as, though not limited to: nuclear, fossil, oil or gas power stations; chemical or petrochemical plants; or airport/aircraft air traffic control equipment or the like.

Herein the term "plant" is intended to mean any machinery and/or buildings of an industrial or commercial site.

Presently, maintenance service or repair of large industrial plants, such as power stations, is dependent on a paper recording system which uses a defect card system. The long established and accepted defect card system is used by engineers or operators when a malfunction/defect is noticed or observed in the plant. The engineer or operator fills out the defect card with the said malfunction and hand delivers the card to the often remote planning office. There is then a procedure of recording, assessing and inspecting the fault. A computer system is used for recording and storing this information. This can be a time-consuming process and dangerous in some instances if the fault is serious and needs urgent attention.

Present plant identification system is alpha/numeric

based on unit reference/system/sequential number, e.g.

TG7/OL/103Y	which relates to
TG7	Turbo Generator No 7
OL	Oil Lubrication
103	Valve Number 103
Y	By-pass valve.

Such a system has severe limitations, and when this plant ID is called upon to screen there is very little additional information attached. Assessments are plant based, time consuming and labour intensive, as is the supporting work preparation stage.

The use of defect cards is therefore very labour intensive and time consuming. The defect cards can also be lost. The defect cards when filled out are prioritised by the plant operations/engineering staff in order of importance. The maintenance jobs are therefore allocated a time by which they must be done. For example, if the job is urgent it must be done as soon as possible. Present systems also employ manuals which seek to assist in location and specification of components throughout the plant. To find a specific component in the plant using this manual is very time-consuming and not at all easy. It also only creates a schematic representation as to where the plant item with a malfunction is, making it difficult to find the required "real" location. Spares withdrawal from stock also tends to be labour intensive.

It is an object of at least one aspect of the present invention to obviate/mitigate one or more of the aforementioned problems/disadvantages in the prior art.

It is a further object of at least one aspect of the present invention to provide means to improve the efficiency of maintaining/repairing any factory or power plant.

It is a further object of at least one aspect of the present invention to provide a system which plant fault location enhances the reporting process, simplifies information transfer, accurately co-ordinates safety assessments, improves isolation procedures for (PFW) Permit For Work preparation, standardises reporting and creates a more efficient spares allocation stock control and procurement.

Summary of the Invention

According to a first aspect of the present invention there is provided a method of maintaining a plant, the method having the steps of:

(a) marking one or more component parts of the plant each with a unique machine readable indicia;

(b) identifying that a particular part requires to be maintained or replaced;

(c) reading defect information comprising the unique indicia of the particular part by indicia reading

means; and

(d) transmitting the defect information to a central processing area.

Advantageously the method further comprises the steps of:

(e) identifying the particular part by the transmitted defect information;

(f) maintaining/replacing the particular part.

The applicant has named this method "SYSTEMATIC RECORDING TECHNOLOGY" (SRT).

Preferably, in step (a) the unique machine readable indicia comprises a bar code of a type now known.

Preferably, in step (b), defect of the particular part is identified by any of:

plant malfunction;

routine testing;

routine plant surveillance.

Preferably, step (b) also includes an additional step after identifying that the particular part requires to be maintained of allocating a defect type, and preferably storing the defect type information on the indicia reading means.

The defect type may be selected from:

mechanical plant failure;

electrical plant failure;

control and instrumentation failure.

Preferably, in step (c) the indicia reading means comprises a bar code reader and preferably a hand-held bar code reader. The bar code reader may be a hand-held Psion Workabout 2Mb computer available from RS catalogue 1999 having an integral bar code scanner or wand and an RS232 interface port.

Preferably, step (c) includes the step of at least temporarily storing the defect information in memory means in the indicia reading means.

Preferably, step (c) also includes the steps of inputting the defect information regarding defect origin and defect type.

Preferably, step (d) comprises transmitting the defect information to the central processing area via a telecommunications network within the plant, e.g. a local area network (LAN) or internal telephone system.

Preferably, step (e) comprises the additional steps of:

allocating the defect to a specialist assessor, accessing plant database to obtain full technical specification of plant item, plant history, safety assessment, records, recommended PFW isolations and shares availability.

Preferably, step (f) comprises the additional steps of:

carrying out repair, recording the method of repair

and recording if any additional defects found.

Preferably, after steps (a) to (f):

there is provided a step of transferring reports to plant history wherein the reports are held in standardised format.

According to a second aspect of the present invention there is provided a plant wherein one or more component parts thereof are marked with a unique machine readable indicia.

The indicia may include one or more of the following pieces of information regarding the/each part: plant component location, plant system and/or plant system location.

The plant may be a pre-existing plant, and the part(s) may be marked after the plant has been commissioned or used.

The plant may be selected from: an electrical power generating station, e.g. a nuclear, fossil, oil or gas power station, a chemical or petrochemical installation, an airport/aircraft/air traffic control equipment, an oil/gas production well or rig or the like.

According to a third aspect of the present invention there is provided a component part for use in a plant, the part being marked with a unique machine readable indicia.

The part may be marked with the unique indicia by means of etching, embossing or labelling.

According to a fourth aspect of the present invention there is provided a system for maintaining a plant, the system having;

(a) one or more component parts of the plant each marked with a unique machine readable indicia;

(b) means for identifying that a particular part requires to be maintained or replaced;

(c) means for reading defect information comprising the unique indicia of the particular part; and

(d) means for transmitting the defect information to a central processing area.

Advantageously the system further comprises:

(e) means for identifying the particular part by the transmitted defect information;

(f) means for maintaining/replacing the particular part.

According to a fifth aspect of the present invention, there is provided a factory or power plant where substantially all relevant working parts have a unique bar code.

According to a sixth aspect of the present invention, there is provided means for reading the unique bar code.

Preferably, the reading means is a portable bar code reader.

According to a seventh aspect of the present invention, there is provided a method that when a fault is

detected in a factory or power plant, a bar code can be electronically read off a faulty article, downloaded onto a bar code reader, and transmitted to a central processing area.

Preferably, the information is transmitted by e-mail.

Preferably, the plant or factory has a multiplicity of points which enable the bar-code reader to be plugged into and transfer the required information to the central processing area.

Preferably, when the bar code reading is down-loaded, a three-dimensional representation for the position of the faulty article in the factory or power plant is displayed.

Preferably, the information being transmitted is also sent to a computer controlling the storing of spares.

Preferably, the information being transmitted is also linked to a legislative safety assessments section.

Preferably, the information being transmitted is also linked to an area which distributes permits for work isolation.

Preferably, the information being transmitted is linked to a database that stores plant history and lifetime records in compliance with requirements such as nuclear site licences. Preferably, the information being transmitted is linked to a database for plant history and historical records for review and trend assessment.

Preferably, the plant or factory is a nuclear, fossil,

oil and gas power plant; chemical plant or airport/air traffic control application.

When a defect is located or observed, a bar code reader reads the bar code off the faulty part and electronically transfers this information to a control area. This has the advantage of expediting the maintenance procedure.

According to an eighth aspect of the present invention there is provided a three-dimensional map of a plant, wherein the plant is divided into a plurality of zones, each zone having a predetermined volume, and the map providing a unique three-dimensional reference for each zone.

One or more component parts of the plant may be marked with a unique indicia.

The unique indicia may include the three-dimensional reference for the zone in which the component part belongs or is located. The map may therefore assist in the maintenance, location, repair or replacement of a particular component part.

The map may be stored on a portable unique indicia reader means and optionally also on a remote computer.

According to a ninth aspect of the present invention there is provided a method of surveying one or more component parts of a plant, the method comprising the steps of:

(a) marking one or more component parts of the plant each with a unique machine readable indicia;

(b) providing a portable indicia reading machine;

(c) measuring or identifying a value of a parameter of one of the component parts; and

(d) inputting the value of the parameter into the portable indicia reading machine.

In this way the parameters of various component parts e.g. valve, motors, or the like may be monitored on a periodic basis, e.g. daily, and a present parameter value compared to past parameter value(s) and/or a predetermined desired parameter value, such that if the present parameter value differs from said past parameter value(s) or predetermined desired parameter value by a predetermined amount then a decision will follow that the component part will require to be serviced, repaired or replaced.

The machine readable indicia may comprise a bar code.

The value of a parameter may be measured or identified visually by a user, e.g. from a meter or gauge associated with the component part.

The parameter may comprise, e.g. a pressure, temperature flow rate, or the like.

The portable indicia reading machine may comprise a hand-held device.

This method may assist in component trend analysis.

Brief Description of the Drawing

There is now provided a description of a number of embodiments of the present invention with reference to the accompanying drawing which is:

Figure 1 is a schematic representation of a plant according to an embodiment of the present invention.

Detailed Description of the Drawing

Referring to Figure 1 there is illustrated a plant, generally designated 5, according to an embodiment of the present invention.

The plant 5 includes a plurality of component parts 10 each marked with a unique machine readable indicia 15.

The indicia 15 may include one or more or the following pieces of information regarding the particular part 10: plant component/item location, plant system and plant system component.

It will be appreciated that the plant 5 can be a pre-existing plant, and the part(s) 10 may be marked after the plant 5 has been commissioned or used.

Further the plant 5 can be: an electrical power generating station, e.g. a nuclear, fossil, oil or gas power station; a chemical or petrochemical installation; an airport/aircraft/air traffic control equipment; an oil/gas/ production well or rig or the like.

The parts 10 are marked with a unique indicia by

means of etching, embossing or labelling.

The plant 5 includes a system for maintaining the plant 5, the system having:

(a) the one or more component parts 10 of the plant 5 each marked with a unique machine readable indicia 15;

(b) means for identifying that a particular part 10 requires to be maintained or replaced;

(c) means 20 for recording defect information comprising the unique indicia of the particular part;

(d) means 25 for transmitting the defect information to a central processing area 30.

In this embodiment the system further comprises:-

(e) means 35 for identifying the particular part by the transmitted defect information, e.g. a computer having a database of parts;

(f) means 40 for maintaining/replacing the particular part.

The means for identifying that a particular part requires to be maintained or replaced may comprise visual "walk round" inspection by a member of staff.

The means 35 for identifying the particular part comprise a computer including a database comprising a three-dimensional map of the plant. The map divides the plant 5 into a plurality of zones, each zone having a

predetermined value, and the map providing a unique three-dimensional grid reference for each zone.

The unique indicia 15 of each part 10 includes the three-dimensional reference for the component part 10, i.e. which zone the part 10 is located within.

In use, a method of maintaining the plant 5 according to the present invention comprises the steps of:

(a) marking one or more component parts 10 of the plant 5 each with a unique machine readable indicia 15;

(b) identifying that a particular part 10 requires to be maintained or replaced;

(c) reading defect information comprising the unique indicia 15 of the particular part 10 by indicia reading means 20;

(d) transmitting the defect information to a central processing area 30.

The method further comprises the steps of:

(e) identifying the particular part 10 by the transmitted defect information;

(f) maintaining/replacing the particular part 10.

The applicant has named this method "SYSTEMATIC RECORDING TECHNOLOGY" (SRT).

In step (a) the unique machine readable indicia comprises a bar code of the type now known.

In step (b) defect of the particular part is

identified by any of:

plant malfunction;

routine testing;

routine plant surveillance.

Step (b) also includes the additional step of identifying that the particular part 10 requires to be maintained or allocating a defect type and preferably storing defect type information in the indicia reading means 20.

The defect type may be selected from:

mechanical plant failure;

electrical plant failure;

control or instrumentation failure.

Preferably in step (c) the indicia reading means 20 comprises a bar code reader and preferably a hand-held bar code reader. The bar code reader may be a Psion Workabout 2Mb computer obtainable from RS catalogue 1999.

Step (c) includes the step of at least temporarily storing the defect information in memory means in the indicia reading means 20.

Step (c) also includes the steps of inputting the defect information regarding defect origin and defect type.

Step (d) comprises transmitting the defect information to the central processing area via a telecommunications network within the plant, e.g. a local area network (LAN) or internal telephone system.

In a preferred embodiment step (e) comprises the additional steps of:

allocating the defect to a specialist assessor assessing plant database to obtain full technical specification of plant item, plant history, safety assessment records, recommended PFW isolations and spares availability.

Also in the preferred embodiment step (f) comprise the additional steps of:

carrying out repair, recording the method or repair and recording of any additional defects found.

Further in the preferred embodiment after steps (a) to (f):

transferring all reports to plant history and reports to be to standard format.

It will be apparent from the foregoing that by applying a unique indicia (i.e. bar coding) to the/each building of a plant, then subdividing the/each building into three-dimensional subsections or grids it is possible to direct or navigate an operative of a workforce to a location of a desired plant component, typically within a few metres. This is because if the three-dimensional map is stored in the indicia reader then by reading a component indicia one can establish ones position in the plant 5. Thereafter, an operative using a hand held reader can read the bar codes on plant components at the location until a

match is achieved with the bar code on applicable work instructions or job cards. Therefore not only does the operative navigate accurately to the desired plant component but a final quality assessment check can be carried out at the location thereby confirming the correct plant item to be marked or tested. Additionally, the plant spares located in the site stores are identified by the same bar code as the plant 5. By this means a further quality assurance check is automatically applied before spares are drawn and fitted.

Furthermore, there is provided a method of surveying one or more component parts of the plant 5, the method comprising the steps of:

(a) marking one or more component parts 10 of the plant each with a unique machine readable indicia 15

(b) providing a portable indicia reading machine 20;

(c) measuring or identifying a value of a parameter of one of the component parts 10; and

(d) inputting the value of the parameter into the portable indicia reading machine 20.

In this way the parameters of various component parts 10 e.g. valve, motors, or the like may be monitored on a periodic basis, e.g. daily, a present parameter value compared to past parameter value(s) and/or a predetermined desired parameter value such that if the present parameter

value differs from said past parameter value(s) or predetermined desired parameter value by a predetermined amount then the component part will require to be serviced, repaired or replaced.

In this embodiment, the machine readable indicia comprises a bar code.

In practice the value of a parameter such as pressure, temperature, flow rate, or the like is measured or identified visually by the user e.g. from a meter or gauge associated with the component part 10.

In this embodiment the portable indicia reading machine 20 is a hand-held device.

It will be apparent that the method of the present invention by allowing comparison of parameter data may assist in component trend analysis.

Thus assist routine plant surveillance hand held machine 20 or readers can be programmed with plant parameters; such as temperature, pressure, flow rate etc and compared with previous readings. Thus present plant component parameters may be automatically displayed e.g. on a screen of the hand-held device against the current readings. Alternatively or additionally the plant parameter readings may be downloaded to another computer e.g. a PC. By this method plant trends can be identified before faults or defects develop.

A number of examples are now given of particular

plants to which the present invention may be applied.

NUCLEAR POWER STATION

Below is a DESCRIPTION for the maintenance of a nuclear power plant.

Step 1

1. Defect Origin

(i) plant malfunctioning

(ii) routine testing

(iii) routine plant surveillance

Step 2

2. Defect Type Allocation

(i) mechanical plant failure

(ii) electrical plant failure

(iii) control and instrumentation failure

Step 3

3. Defect Reporting Via Portable Reader

(i) read zone code

(ii) read plant code

(iii) enter defect origin

(iv) enter defect type

Step 4

4. Download to Engineering System

(i) read compact disc or portable reader to system

(ii) check system receives defect via auto allocation of defect reference number

(iii) log defect reference in central control room record

Step 5

5. Engineering System Process

(i) auto allocation to specialist assessor

(ii) specialist confirms receipt of defect

Step 6

6. Assessment

(i) read plant item identifier

(ii) read plant item location

(iii) read plant item defect type

(iv) read plant item specification

(v) read plant item history

(vi) read plant item safety assessment

(vii) read plant item hazard statement

(viii) read plant item noise assessment

(ix) read plant item hot working assessment

(x) read plant item health physics assessment

(xi) read plant item safety release assessment

(xii) read recommended permit for work (PFW) isolation

(xiii) read IOR limitations where applicable

Step 7

7. Schedule

(i) allocate rectification priority

(ii) read spares inventory

(iii) programme rectification date - 7 day rolling programme

Step 8

8. Rectification

(i) release plant from service and isolate

(ii) prepare permit for work (PFW)

(iii) issue work schedule plus safety assessment

(iv) Issue PFW

(v) rectify defect

(vi) record defects found and repair executed to format

(vii) sign off PFW

(viii) cancel PFW

Step 9

9. Recommission

(i) remove isolation

(ii) confirm plant safe

(iii) re-commission plant

(iv) confirm CCR master record updated

Step 10

10. Record to History

(i) read defect found and repair executed step 8(vi)

(ii) record step 10(i) to plant history by standard format or scan step 8 (vi) to history

(iii) confirm stock update and procurement re-order requirements in hand where appropriate.

Step 1 involves the detection of the plant or system defect. The defect can be detected by a plant malfunction, routine testing or plant surveillance.

Step 2 involves the defect type allocation. Plant defects can be categorised into three types: mechanical plant failure, electrical plant failure and control/instrumentation failure.

Step 3 involves the reporting of the defect. When the

defect is located, the engineer or operator passes a portable bar code reader over the unique bar code of the faulty device. The defect type is also entered at this stage.

Step 4 involves this information being electronically downloaded into the engineering support system computer. The engineering support system computer creates the following:

a three-dimensional plant location;

an automatic location check between zone and plant identification;

a bar code link between plant and spares in stock;

a bar code link to nuclear site licence safety assessments;

a bar code link to legislated safety assessments;

a bar code link to permit for work isolations;

a bar code link to plant history and lifetime records in compliance with nuclear site licence where applicable; and

a bar code link to plant history and historical records for review and trend assessment.

The portable bar code reader transfers information to the engineering support system computer where it is allocated a reference number and recorded in a central control function.

Step 5 is where there is the first real effective step

in the repair process. The defect is allocated to an engineering specialist with the required technical abilities, e.g. electrical, mechanical and control and instrumentation training. The assessor then confirms receipt of the defect allocated for assessment.

Step 6 is the assessment stage. This stage covers the detailed assessment of the plant specification, past history, repair procedures and any hazards or safety features which must be taken into account during repairs. There is detailed assessment for rectification to take account of all legislative and safety requirements. Assessments must also address isolation for permit for work purposes and spares availability.

Step 7 involves the planning into a programme of work. Spare parts must also be confirmed as being available in this programme.

Step 8 involves the repair process after the plant has been released from being service-isolated and made safe followed by the issue of a safety document to allow the repair work to proceed. On completion of repairs, the safety documents are cancelled in preparation for return to service.

Step 9 is where the plant isolation is removed and the plant is prepared for return to service. The recommissioning involves the removal of isolation restrictions. The return to service is at the discretion

of the central control function.

Step 10 is where the plant records are updated. The stock records are computer updated and the spares position is checked for possible re-order.

Although the above procedure is for a nuclear power plant, small alterations also make it suitable for oil, gas, fossil and petrochemical applications and airport authorities and air traffic control.

FOSSIL FUEL POWER STATION

For a fossil power plant steps 1 to 10 as hereinbefore described are used:

OIL/GAS/CHEMICAL PLANTS

For oil, gas and (petro)chemical applications, steps 1 to 10 as hereinbefore described may be performed. However step 6 is altered so that the following procedure can be used;

Step 6

6. Assessment

(i) read plant item identifier

(ii) read plant item location

(iii) read plant item defect type

(iv) read plant item specification

(v) read plant item history

(vi) read plant item safety assessment

(vii) read plant item hazard assessment

(viii) read plant item noise assessment

(ix) read intrinsically safe assessment

(x) read plant item safety release assessment

(xi) read recommended permit for work (PFW) isolation

AVIATION RELATED PLANT AND EQUIPMENT

For airport authorities and air traffic control, steps 1 to 10 as hereinbefore described may be performed. However step 6 is also altered;

Step 6

6. Assessment

(i) read plant item identifier

(ii) read plant item location

(iii) read plant item defect type

(iv) read plant item specification

(v) read plant item history

(vi) read plant item safety assessment

(vii) read plant item hazard statement

(viii) read plant item noise assessment

(ix) read plant item safety release assessment

(xii) read recommended permit for work (PFW) isolation

By using the above procedures and using a unique bar code on all separate working parts, it is possible to use a portable bar code reader to electronically transfer the information of the faulty component by e-mail or by plugging the portable bar code reader into a computer network. The information that there is a malfunction and its type is therefore transmitted quickly and efficiently to a central area. The bar code reader also provides a 3-D plant location of the faulty article, spares, inventory and stock location, plant history, all safety assessments and plant release regulations and permit for work isolations.

The system therefore precisely identifies the plant location, enhances the reporting process, simplifies information transfer, accurately co-ordinates safety assessments, improves isolation procedure for permit for work preparation, standardises reporting and creates a more efficient spares allocation stock control and procurement.

It will be appreciated that the embodiments of the invention hereinbefore described are given by way of example only, and not meant to limit the scope thereof in any way.

CLAIMS

1. A method of maintaining a plant, the method having the steps of:

(a) marking one or more component parts of the plant each with a unique machine readable indicia;

(b) identifying that a particular part requires to be maintained or replaced;

(c) reading defect information comprising the unique indicia of the particular part by indicia reading means; and

(d) transmitting the defect information to a central processing area.

2. A method according to claim 1, wherein the method further comprises the steps of:

(e) identifying the particular part by the transmitted defect information;

(f) maintaining/replacing the particular part.

3. A method according to any preceding claim, wherein in step (a) the unique machine readable indicia comprises a bar code.

4. A method according to any preceding claim, wherein in step (b), defect of the particular part is identified by

any of:

plant malfunction;

routine testing;

routine plant surveillance.

5. A method according to any preceding claim, wherein step (b) also includes the additional step after identifying that the particular part requires to be maintained of allocating a defect type, and preferably storing the defect type information on the indicia reading means.

6. A method according to claim 5, wherein the defect type is selected from:

mechanical plant failure;

electrical plant failure;

control and instrumentation failure.

7. A method according to any preceding claim, wherein in step (c) the indicia reading means comprises a bar code reader and preferably a hand-held bar code reader.

8. A method according to claim 7, wherein the bar code reader is a hand-held computer having an integral bar code scanner or wand and an interface port.

9. A method according to any preceding claim, wherein step (c) includes the step of at least temporarily storing the defect information in memory means in the indicia reading means.

10. A method according to any preceding claim, wherein step (c) also includes the steps of inputting the defect information regarding defect origin and defect type.

11. A method according to any preceding claim, wherein step (d) comprises transmitting the defect information to the central processing area via a telecommunications network within the plant.

12. A method according to any claims 2 to 11, wherein step (e) comprises the additional steps of:

allocating the defect to a specialist assessor, accessing plant database to obtain full technical specification of plant item, plant history, safety assessment, records, recommended PFW isolations and shares availability.

13. A method according to any of claims 2 to 12, wherein step (f) comprises the additional steps of:

carrying out repair, recording the method of repair and recording if any additional defects found.

14. A method according to any of claims 2 to 13, wherein after steps (a) to (f):

there is the transferring of all reports to plant history wherein the reports are to be in standard format.

15. A plant wherein one or more component parts thereof are marked with a unique machine readable indicia.

16. A plant according to claim 15, wherein the indicia includes one or more of the following pieces of information regarding the/each part: plant item location, play system and plant system location.

17. A plant according to any of claims 15 and 16, wherein the plant is a pre-existing plant, and the part(s) are marked after the plant has been commissioned or used.

18. A plant according to any of claims 15 to 17, wherein the plant is selected from one of: an electrical power generating station, such as a nuclear, fossil, oil or gas power station; a chemical or petrochemical installation; an airport/aircraft/air traffic control equipment; an oil/gas production well or rig or the like.

19. A component part for use in a plant, the part being marked with a unique machine readable indicia.

20. A part according to claim 19, wherein the part is marked with the unique indicia by means of etching, embossing or labelling.

21. A system for maintaining a plant, the system having;

(a) one or more component parts of the plant each marked with a unique machine readable indicia;

(b) means for identifying that a particular part requires to be maintained or replaced;

(c) means for reading defect information comprising the unique indicia of the particular part; and

(d) means for transmitting the defect information to a central processing area.

22. A system according to claim 21, wherein the system further comprises:

(e) means for identifying the particular part by the transmitted defect information;

(f) means for maintaining/replacing the particular part.

23. A factory or plant where a plurality of working parts have a unique machine readable indicia in the form of a bar code.

24. A device for reading unique indicia when used in a

method according to any of claims 1 to 14.

25. A device according to claim 24, wherein the device is a portable bar code reader.

26. A method that when a fault is detected in a factory or power plant, a bar code can be electronically read off a faulty article, downloaded onto a bar code reader, and transmitted to a central processing area.

27. A method according to claim 26, wherein the information is transmitted by e-mail.

28. A method according to any of claims 26 and 27, wherein the plant or factory has a multiplicity of points which enable the bar-code reader to be plugged into and transfer the required information to the central processing area.

29. A method according to any of claims 26 to 28, wherein when the bar code reading is down-loaded, a three-dimensional representation for the position of the faulty article in the factory or power plant is displayed.

30. A method according to any of claims 26 to 29, wherein the information being transmitted is also sent to a computer controlling the storing of spares.

31. A method according to any of claims 26 to 30, wherein the information being transmitted is also linked to a legislative safety assessments section.

32. A method according to any of claims 26 to 31, wherein the information being transmitted is also linked to an area which distributes permits for work isolation.

33. A method according to any of claims 26 to 32, wherein the information being transmitted is linked to a database that stores plant history and lifetime records in compliance with requirements such as nuclear site licences.

34. A method according to any of claims 26 to 33, wherein the information being transmitted is linked to a database for plant history and historical records for review and trend assessment.

35. A method according to any of claims 26 to 34, wherein the plant or factory is a nuclear, fossil, oil and gas power plant; chemical plant or airport/air traffic control application.

36. A method according to claims 26 to 35, wherein when a defect is located or observed, a bar code reader reads the

bar code off the faulty part and electronically transfers this information to a control area which has the advantage of expediting the maintenance procedure.

37. A three-dimensional map of a plant, wherein the plant is divided into a plurality of zones, each zone having a predetermined volume, and the map providing a unique three-dimensional reference for each zone.

38. A map according to claim 37, wherein one or more component parts of the plant are marked with a unique indicia.

39. A map according to any of claims 37 and 38, wherein the unique indicia includes the three-dimensional reference for the zone in which the component part belongs.

40. A map according to any of claims 37 to 39, when used in a method for in the maintenance, location, repair or replacement of a particular component part(s) of the plant.

41. A method of surveying one or more component parts of a plant, the method comprising the steps of:

(a) marking one or more component parts of the plant each with a unique machine readable indicia;

(b) providing a portable indicia reading machine;

(c) measuring or identifying a value of a parameter of one of the component parts;

(d) inputting the value of the parameter into the portable indicia reading machine.

42. A method according to claim 41, wherein the parameters of one or more component parts are monitored on a periodic basis, and a present parameter value compared to past parameter value(s) and/or a predetermined desired parameter value, such that if the present parameter value differs from the said past parameter value(s) or predetermined desired parameter value by a predetermined amount then the component part will require to be serviced, repaired or replaced.

43. A method according to any of claims 41 and 42, wherein the machine readable indicia comprises a bar code.

44. A method according to any of claims 41 to 43, wherein the value of a parameter is measured or identified visually by a user from a meter gauge or the like associated with the component part.

45. A method according to any of claims 41 to 44, wherein the parameter comprises a pressure, temperature, flow rate, or the like.

46. A method according to any of claims 41 to 45, wherein the portable indicia reading machine comprises a hand-held device.

47. A method according to any of claims 41 to 46, wherein the method is used in component trend analysis.

48. A method of maintaining a plant substantially as hereinbefore described with reference to the accompanying drawing.

49. A plant substantially as hereinbefore described with reference to the accompanying drawing.

50. A component part for use in a plant substantially as hereinbefore described with reference to the accompanying drawing.

51. A system for maintaining a plant substantially as hereinbefore described with reference to the accompanying drawing.

52. A device substantially as hereinbefore described with reference to the accompanying drawing.

53. A map of a plant substantially as hereinbefore

described with reference to the accompanying drawing.

INVESTOR IN PEOPLE

Application No:	GB 0019139.5	**Examiner:**	Mike Davis
Claims searched:	1-14,21-22,24-36,48,51,52	**Date of search:**	5 October 2000

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.R): G4H (HJ)

Int Cl (Ed.7):

Other: Online: WPI, EPODOC, JAPIO

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
X	GB 2317479 A	(SAMSUNG)	26 at least
X	GB 2314658 A	(SAMSUNG)	"
X	EP 0483035 A2	(IBM)	"
X	FR 2626080 A1	(GENERALE DE MAINTENANCE), and its EPODOC Abstract, and its WPI Abstract (Accession No.1989-258201[36])	1-4,2 1-22, 24-26 at least

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
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